GeoCommunicator
Technology and Architecture

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Change History

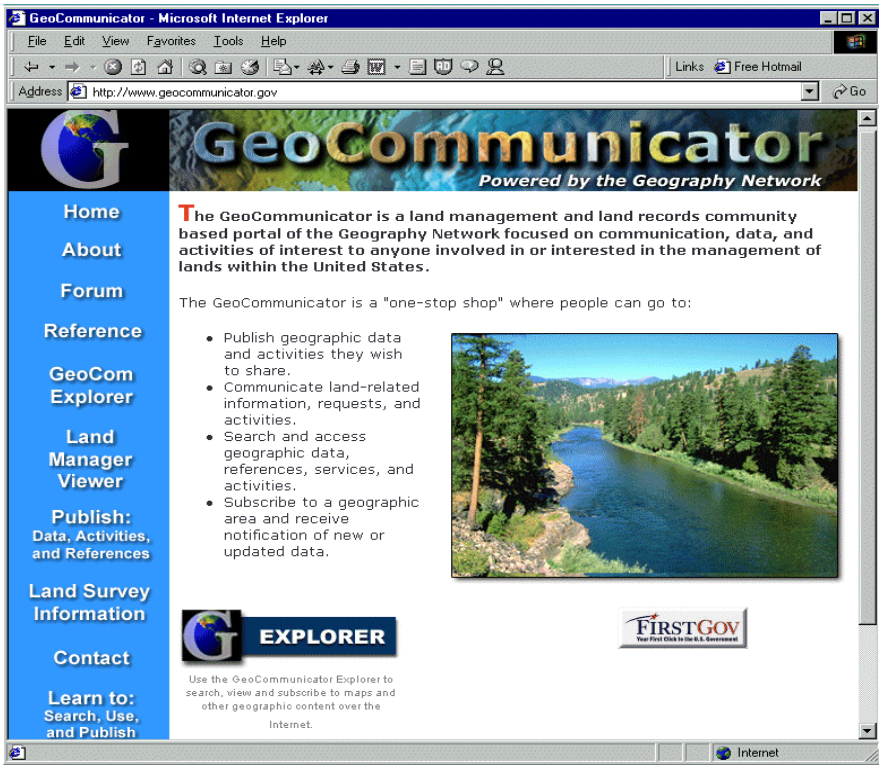
Version		Date	Description	Primary Author(s)
0.1	Draft 1	06.20.00	Draft for internal ESRI review	Jordan Henk
0.2	Draft 2	06.23.00	Second draft for ESRI review	Jordan Henk
0.3	Draft 3	08.03.00	Third draft for ESRI review	Mark Williams
0.4	Draft 4	01.28.03	Forth draft for ESRI review	Boykin Witherspoon Ling Zhuang

Introduction

About GeoCom

The GeoComunicator (GeoCom) is an Internet-based portal for exploring and sharing information about data and activities related to land records management. To reduce the cost of development, GeoCom will leverage ESRI's Geography Network to the fullest extent possible. GeoCom will incorporate many of the features of the Geography Network and will include enhanced search capabilities and reference material for parcel, survey, and other land records related data. In addition to taking advantage of the Geography Network COTS software, GeoCom will take advantage of the metadata and metadata engine of the Geography Network further reducing the development costs for GeoCom. The GeoCommunicator is designed to be the "Land Records Channel" of the Geography Network.

GeoCom tools include:

- **Search tools to define content-based and spatially-based queries**
- **Tools to view query results, combine multiple maps in html-based browser, navigate to provider web sites, and when available, download or stream data directly from the browser window**
- **A subscription-notification service based on user-defined content and area of interest**
- **Interactive mapping for display and search of land manager contact information for all BLM districts, forest service regions, and federal lands**
- **The gateway to download public land survey information**
- 

About the ESRI Geography Network

The ESRI Geography Network is a global network of geographic information users and providers. It provides the infrastructure needed to facilitate the sharing of geographic information between data providers, service providers, and users around the world. The Internet is used to deliver geographic content to the user's browser and desktop. Through the Geography Network, you can access many types of geographic content including live maps, downloadable data, and more advanced services. The Geography Network content is distributed at many locations around the world, providing you access to the latest information available directly from the source.

About this document

The purpose of this document is to describe GeoCom technology and system architecture and how it relates to the Geography Network. The goal of this document is to provide a conceptual framework for the implementation, maintenance and management of the physical GeoCom system components.

GeoCom/Geography Network Architecture

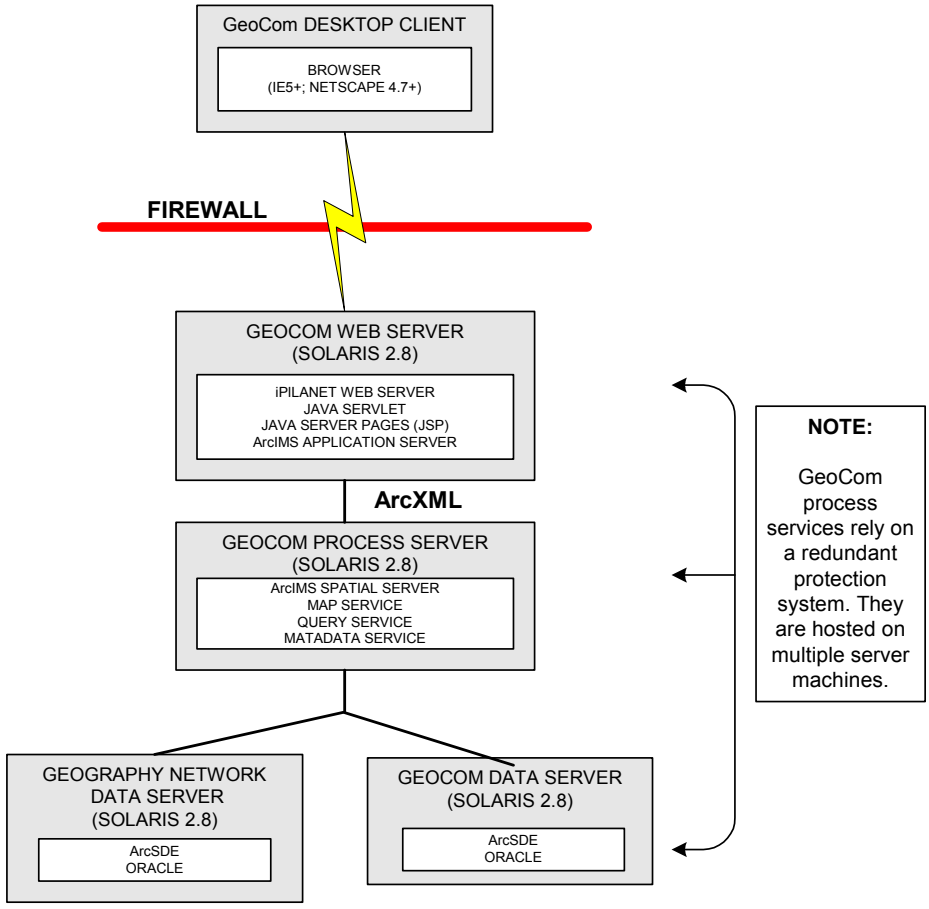
System Components

GeoCom Clients

GeoCom desktop clients will access the GeoCom portal via a compatible web browser. Client access is external (Internet) to the BLM network. The browser-based client application provides the Presentation Tier of the GeoCom architecture.

GeoCom Server Suite

The initial configuration of the GeoCom server suite consists of a number of physical devices including: (1) Web Server, (2) Process Server, and (3) Data Server. GeoCom is configured to employ multiple physical Web Servers, Process Servers and Data Servers to meet the demand for services. GeoCom applies a redundant protection system. Web servers are all load-balanced by dual redundant CSS boxes. Two databases are load-balanced and set up to automatically replicate each other.



GeoCom/Geography Network Web Server

The GeoCom Web Server is the Internet access point through which clients will request and receive page-based content. The GeoCom Web Server and the Geography Network will work in companion to provide land records information. The GeoCom Web Server will access datasets from the main Geography Network database, but will also access data from a GeoCom specific database such as GCDB data, boundary surveys, aerial photography schedules, county parcel data, and tax assessor data. The Web Server includes the physical computing device as well as the operating system including Sun Solaris 2.8, iPlanet Web Server and Internet site management software.

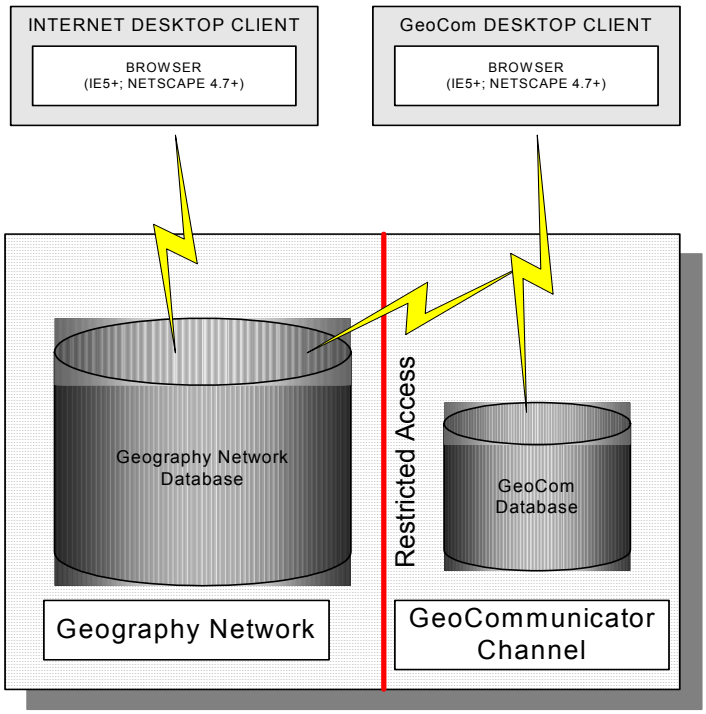
GeoCom Process Server

GeoCom's services will be provided through an integrated suite of software applications. GeoCom's software components will be physically hosted on the Geography Network Web Servers. The Geography Network Process server is a Sun server running Solaris 2.8 and ArcIMS Spatial Server.

The Web Server and the Process Server together will host the essential ArcIMS components and custom application components that provide the Business Logic Tier of the GeoCom /Geography Network architecture.

Data Server

The Data Tier of the GeoCom architecture includes the software and devices required to manage stored data. The GeoCom Data Server will be a UNIX server device that hosts the ORACLE relational database management system (RDBMS). GeoCom business tables and spatial data will be stored in the ORACLE RDBMS and accessed via SQL queries and ESRI's ArcSDE (Spatial Database Engine). GeoCom desktop clients will be able to access data that is hosted on both the Geography Network and data specific to the GeoCom channel.



Network

The GeoCom network includes the physical devices (network servers, local area connectivity, wide area connectivity, and Internet connectivity) and software for managing the network. Communications between the Data Server, Process Server and Web Server will be based on the TCP/IP standard. Communications between the Web Server and the Client will be based on the HTTP standard.

User Roles

Browser

A GeoCom Browser can initiate a search, view search results, combine multiple maps in the browser and navigate to Provider URLs. If the data are available from the provider site, a Browser may download them to local disk. Browsers can view reference materials and participate in user forums. A Browser can become a Subscriber by requesting a Subscriber Account.

Subscriber

GeoCom Subscribers create a simple account on GeoCommunicator, can save their search favorites, and can set parameters for the types of activity and data events about which they would like to receive an automatic notification when such activity or event is updated. Subscribers may add/delete their saved favorites. There is no GeoCom Subscriber fee.

Provider

GeoCom Providers register with GeoCom and use a secure account to manage their catalog information. As part of the catalog, Providers submit data 'footprints', metadata, and the URL or contact information for the data or activity.

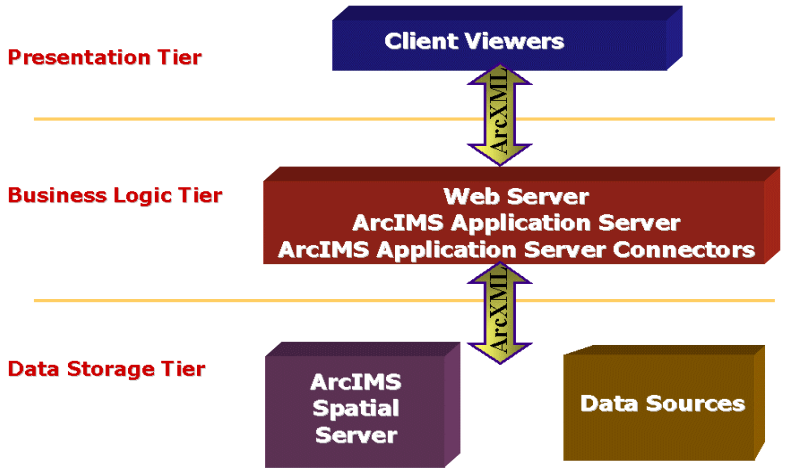
Administrator

The Geography Network's Administrators provide database and system maintenance for GeoCom. The Geography Network will provide site availability and support 24 hours a day, seven days a week. BLM's Administrators can login via Internet to process user feedback and perform administration on GeoCom's data.

GeoCom Technology

ArcIMS Components

ESRI's Internet mapping product, ArcIMS (ArcIMS 4) is the foundation for the GeoCommunicator. ArcIMS is designed to create map services, develop Web pages for communicating with the map services, and to administer an ArcIMS site. ArcIMS is designed to be distributed across a network and to be scalable as demand for maps increases.



ArcIMS Overview

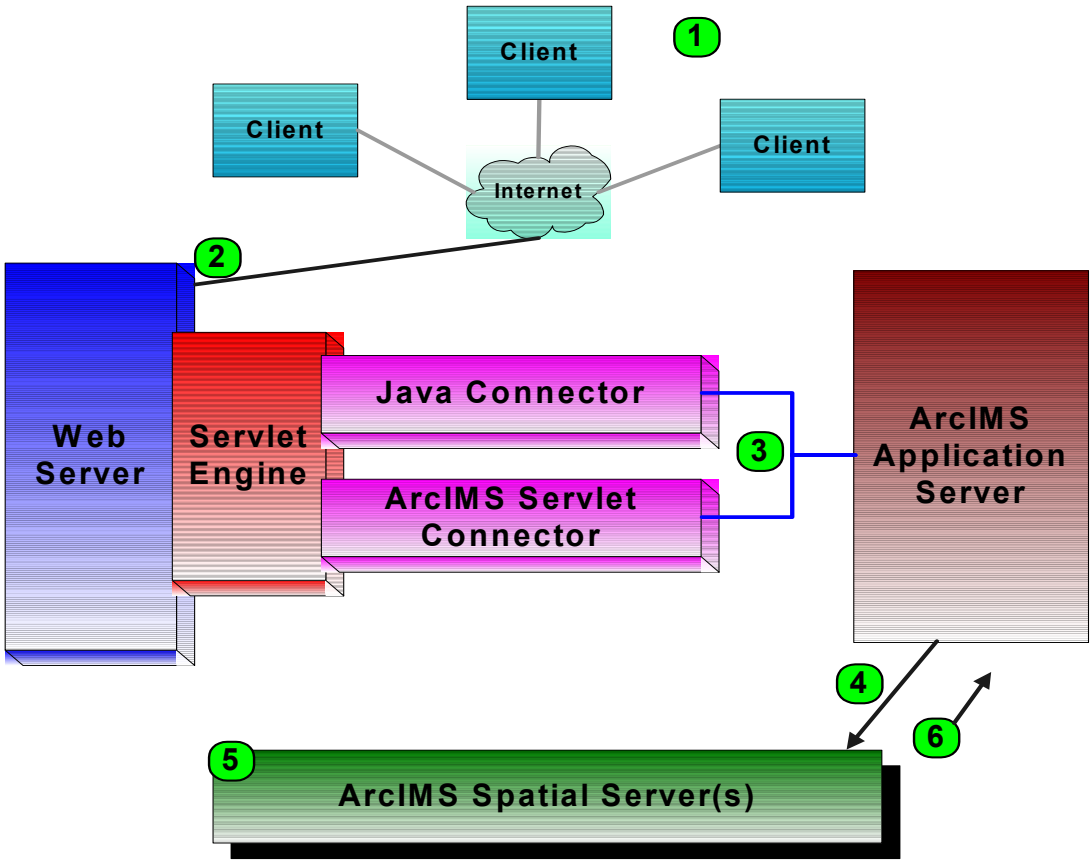
ArcIMS has a multi-tier architecture consisting of presentation, business logic, and data storage tiers. The presentation tier includes the ArcIMS Viewers. The business logic tier includes the Web Server, ArcIMS Application Server, and ArcIMS Application Server Connectors. The data storage tier includes the ArcIMS Spatial Server and any data sources. Communication between the tiers is handled through ArcXML, ArcIMS' version of XML or eXtensible Markup Language

When a request is received by the Web Server, it is handed off to one of the ArcIMS Application Connectors. ArcIMS requests that are processed through the Servlet Connector are immediately handed to the ArcIMS Application Server. The Application Server handles load distribution and keeps track of which MapServices are running on which ArcIMS Spatial Servers. JSP or Java Servlet can use the Java Connector to connect to ArcIMS Application Server.

The backbone of ArcIMS is the Spatial Server. For GeoCom, the server provides three functions: image rendering, attribute querying and metadata searching. An incoming request for a MapService goes to one of the Spatial Servers within the Virtual Server group to which the MapService has been assigned. Maps are generated on the server and sent to a client as a GIF, JPEG, or PNG image.

ArcIMS Communication

When an ArcIMS client makes a request for a map or data, the request travels first to the Web Server and then through the ArcIMS middleware to a Spatial Server. The responses follow the same path in reverse order. All requests and responses are written using ArcXML.



1) Client sends a request to an ArcIMS site.

2) The Web Server receives the request and hands it to the Servlet Connector / Java Connector.

3) The Connector opens a path for the ArcIMS Application Server to respond and the request is handed from the connector to the Application Server.

4) The Application Server sends the request to an available Spatial Server within a Virtual Server group.

5) The Spatial Server generates the response as a Response XML string (such as query results or an image location) stream of data

6) Response follows same path in the reverse order that the request took.

GeoCom/Geography Network Web Service Components

iPlanet Web Server

Web pages on the Geography Network are managed with iPlanet™ Enterprise Web Server. iPlanet is scalable and has a multi threaded, multi-processing architecture.

Java Servlet

A Servlet is a Java class used to extend the capabilities of servers that host applications accessed via a request-response programming model. It can be registered on the iPlanet web server and accessed via iPlanet web server. Combined with JSP, it can apply the MVC (Model-View-Control) structure, which is a dynamic and extendable framework.

JSP

Queries run against the database will be returned as web pages written (generated) in JSP. Java Server Page (JSP) is a server-side scripting feature that works with the iPlanet web server. A Java Server Page is an HTML text file that contains a combination of HTML and JavaScript. As JSP files are altered and saved on the server, the revised scripts will automatically be compiled when Web page is re-loaded.

Viewer Client

Browser Versions Supported

GeoCommunicator is designed to be browser-compatible with Internet Explorer version 5 or higher, and Netscape version 4.7 or higher.

DHTML

Some GeoCom Web pages have DHTML content, which uses features built into fourth generation browsers to make a Web page more dynamic. Dynamic HTML, or DHTML, includes three main technologies - HTML, JavaScript and Cascading Style Sheets (CSS). HTML provides the basic document structure, JavaScript is utilized to manipulate the Document Object Model (DOM), and CSS is used to define the document's presentation and style.

JAVA Script

JavaScript is an interpreted, object-oriented programming language. JavaScript supports a core set of standardized objects, methods and variables. JavaScript is used to enable processing within a document on the client rather than by the server. Web browsers extend the JavaScript language with additional DOM objects such as images, windows, and frames.

Licensing

GeoCommunicator Providers and users (Browsers or Subscribers) will not require the purchase of ESRI-licensed software. However, if Providers elect to offer mapping services via ArcIMS, an ESRI licensed product is required on their Web sites.

Outstanding Issues

ESRI will initially host the GeoCom service at no cost. Based upon historical usage and transaction rates, ESRI and BLM will need to agree on a monthly service fee for continued hosting. Modification and enhancements to the GeoCom web pages will continue to be provided under the GSA rate schedule.